

## PRESS-FORMED GRAIN SNACKS AND PROCESS THEREFOR

### BACKGROUND OF THE INVENTION

[0001] This invention relates to grain-rich snacks and a process for producing them. More particularly, the invention involves press-forming pasty mixtures of grains containing egg white as binding agent to produce snack-size pieces or units which are contacted with superheated steam to set the egg white.

[0002] Snack foods have found increasing popularity and the variety has also increased with time. Pretzels, nuggets, crackers and all sorts of chips are produced and sold in large quantities.

[0003] A principal object of this invention is to provide a different type of snacks formed of grains such as wheat, rye, oats and rice.

[0004] Another important object is to provide a simple and economic process for the mass production of grain snacks.

[0005] A further object is to provide a process based on well-known apparatus capable of continuous and trouble-free operation.

[0006] These and other features and advantages of the invention will be apparent from the description which follows.

### SUMMARY OF THE INVENTION

[0007] In accordance with this invention, a grain, usually cooked as in boiling water, is mixed with liquid egg white (albumen) or egg white powder reconstituted in water, and with desired condiments, and the resulting dough-like or pasty mass is press-formed to produce desired snack shapes. Press-forming can be conducted either by pressing the pasty mass into molding cavities or by extrusion to form rods, thick ribbons, or other continuous shapes that are cut into snack pieces (usually about 2 to 4 inches in length). The snack pieces, formed of extruded material or by pressing in mold cavities, are next contacted with superheated steam usually at a temperature of at least about 300° C. The impingement of superheated steam immediately sets the egg white as a binder of the grain-rich, snack pieces, the surfaces of which are drier than the cores, and are not sticky. The use of superheated steam effects almost instant setting of egg white as binder and formation of skin-like, non-sticky surfaces. This advantageous feature of the invention makes it possible to dry the surfaces of the snack pieces so that they are not sticky to the touch yet the cores are desirably moist and soft in the mouth. This is an ideal combination of physical properties for snack products eaten with the fingers. The texture (feel in the mouth) of a snack is an important factor in gaining wide popularity.

[0008] For rapid and effective treatment with superheated steam, the temperature range of about 300° to 350° C. with a contact period of not more than about 2 minutes is preferred for most grain recipes. Longer contact with superheated steam at lower temperature, say 250° C., is not often used. Temperatures above 350° C. can adversely affect the taste and texture of snacks.

[0009] Inasmuch as grain snacks produced pursuant to this invention are usually made in large quantities for wide

distribution, the use of superheated steam has the additional benefit of sterilizing the snacks before they are frozen and packaged for distribution.

[0010] When the frozen grain snacks are to be consumed, they are heated in any of several ways, e.g. in a conventional or microwave oven, or in hot oil or syrup.

[0011] The mass production of press-formed grain snacks pursuant to this invention is achieved with simple, conventional equipment designed for continuous operation requiring minimal worker attention. For extruded snacks, the basic components of the production system are an extruder with multiple extrusion ports, a common conveyor belt, cutting means to sever the extruded material on the conveyor belt into pieces of desired length, a reticular metal conveyor belt, and steam jets positioned on opposite sides of the upper run of the reticular conveyor. A freezer is frequently used for prompt preparation of the grain snacks for wide distribution.

[0012] Steam generated at any pressure is known as saturated water vapor and has a specific temperature at any selected pressure. Saturated water vapor or steam at any pressure, when isolated from water, can be heated to produce superheated steam. For example, steam generated at a gauge pressure of 60 pounds per square inch has a temperature of about 154° C., but can be heated (in the absence of water) to any higher temperature to yield superheated steam. Thus, 60-pound (gauge) steam (154° C.) heated to a temperature of 300° C. has 146° C. of superheat; heated to 350° C. the steam has 196° C. of superheat. High superheat is desirable to shorten the time of contact with the pasty press-formed snacks to set the albumen as a skin on the snacks and as internal binder without the snacks losing so much moisture as to feel "dried out" in the mouth. High superheat also avoids any condensation of water on the snacks.

[0013] The example of 60-pound steam has been selected because it is a practical pressure commonly used in commercial operations. Lower steam pressures as well as higher pressures can be used but higher pressures entail increased cost without compensating benefit.

[0014] For the purposes of this invention, superheated steam at a temperature in the range of about 300° C. to 350° C. is frequently preferred. For steam pressures ranging from 10-pounds to 100 pounds (gauge), the preferred temperature range will provide between about 130° C. and 235° C. of superheat for the desired setting of albumen in the snacks.

[0015] For press-molded snacks, a large selection of apparatus is available. For example, U.S. Pat. No. 3,964,127 to Holly shows a machine in which ground meat is pressure fed into a mold opening. U.S. Pat. No. 4,276,318 to Orłowski et al discloses another molding apparatus in which food is fed upwardly under pressure into several mold cavities. In the large-scale production of molded snacks pursuant to this invention, a molding apparatus is coupled with a reticular metal conveyor belt having steam jets positioned on opposite sides of the upper run of the reticular conveyor.

[0016] Of course, the molding apparatus is equipped with means for feeding comminuted food thereto, and a freezer usually completes the production system. On some systems, an additional process step, such as frying the snacks, may follow the step of contacting the snacks with superheated steam. Frying is desirable when the grain-rich snack includes comminuted potato, meat, fish, etc.